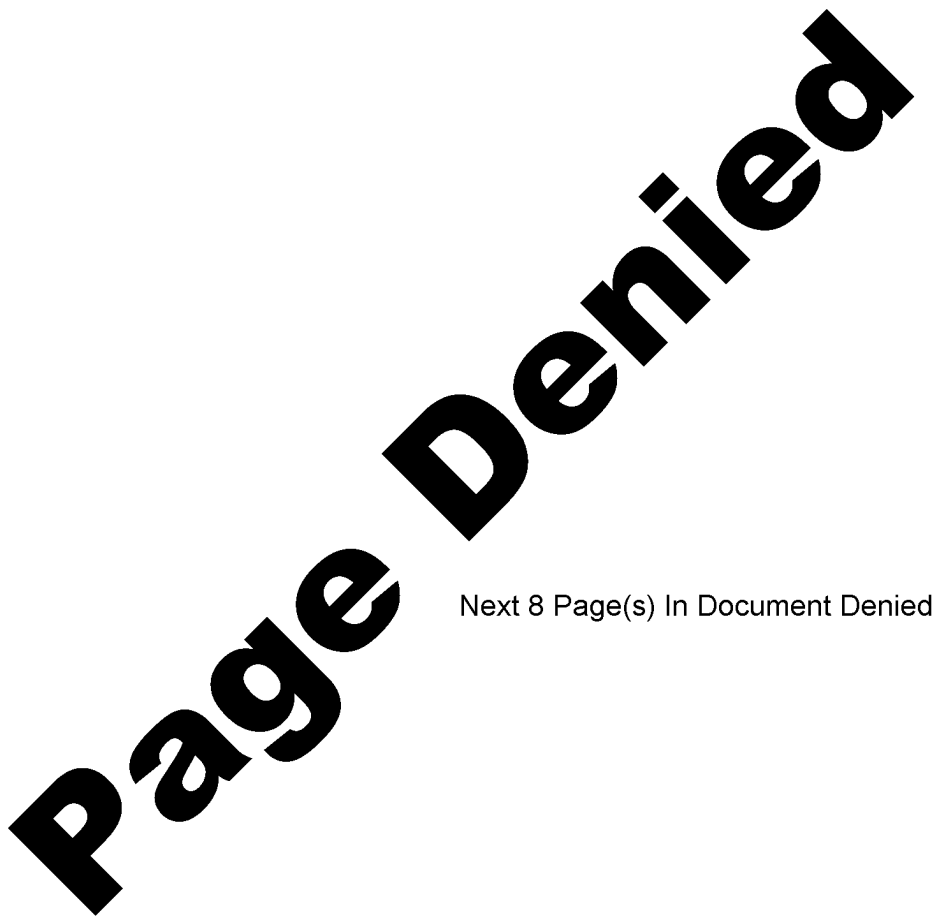

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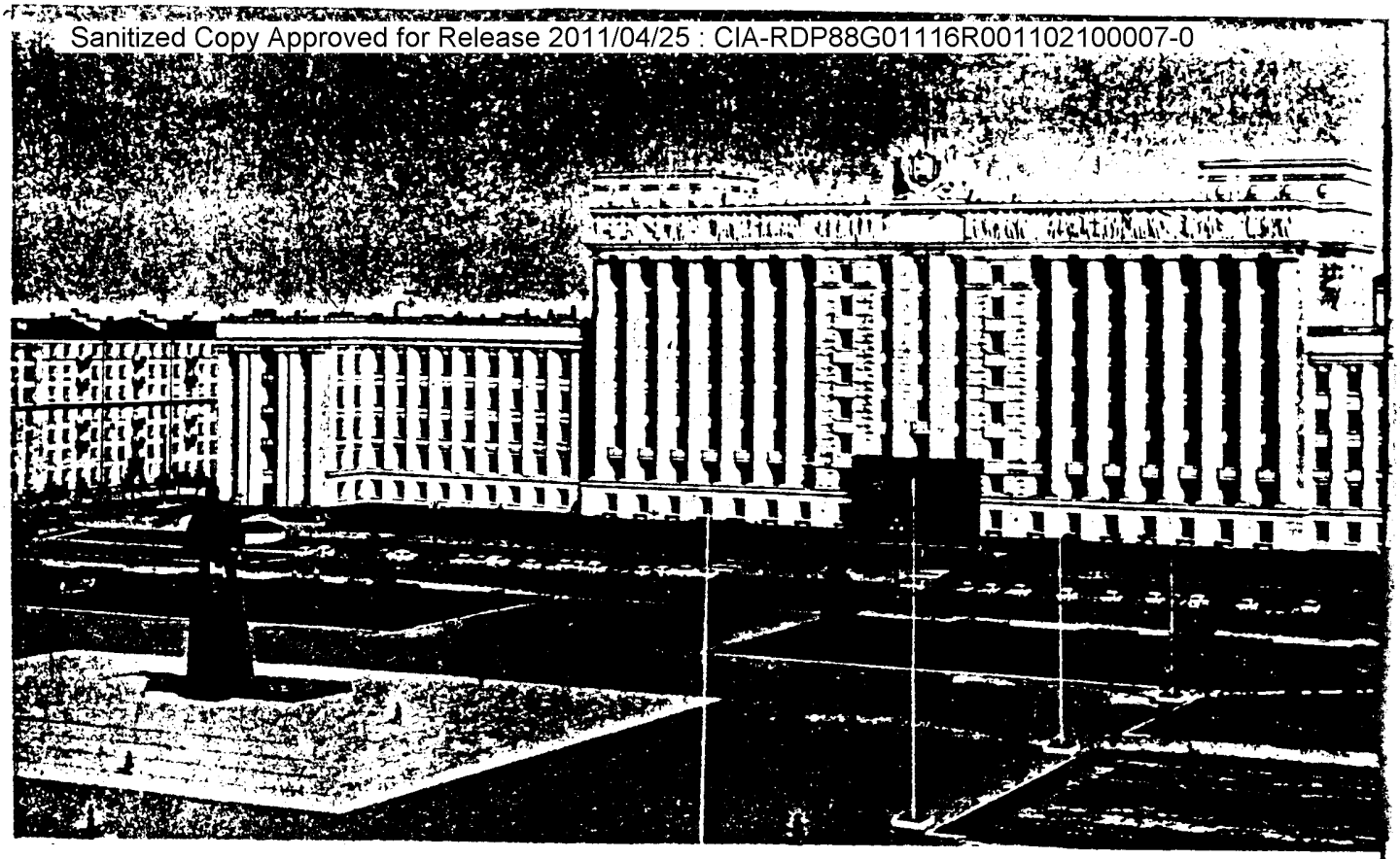

The American connection to Soviet microelectronics

A former Soviet physicist solves a longstanding mystery about the identities of two Americans who disappeared during the Rosenberg spy case and engaged in technology transfer for the Kremlin

Mark Kuchment

Ever since the cold war of the late 1940s, the US, joined at times by Europe, Canada and Japan, has sought to restrict sophisticated technology with military potential from reaching the Soviet Union and its Warsaw Pact allies. Despite such efforts, the US has not been completely successful in achieving the goal of limiting or eliminating the flow of militarily valuable data and products from West to East. The Soviet bloc has been able to acquire advanced technologies from the West in various ways—by espionage and entrepreneurship, as exemplified in Pentagon accounts of Vax 11/782 minicomputers and an array of microelectronics, seismographs and lasers shipped illegally to Warsaw Pact countries through a variety of real and phony companies in Europe and elsewhere. For all the horror stories of spying and smuggling, there have been virtually no instances of scientists and engineers defecting or emigrating to contribute to Soviet military R&D. That is why a case involving two American electrical engineers is so interesting. It is a conspicuous example of technology transfer that, as it happened, lifted a corner of the shroud of secrecy that long concealed military research in the Soviet Union.

About three years ago, while interviewing Soviet émigré scientists, I heard repeated accounts of the successful careers of two Americans—Filipp Georgievich Staros and Iozef Veniaminovich Berg, respectively chief designer and chief engineer of the principal electronics design bureau operating in Leningrad under the auspices of the military during the 1960s and 1970s. While the identities of the defectors could be established through the tales of these émigrés, the dramatic stories of Staros and Berg required some detective work to piece together their lives before their arrival in the USSR.

Staros, it turns out, was born Alfred Sarant, and Berg was Joel Barr. Both were associated in a Communist Party cell during the 1940s with Julius and Ethel Rosenberg, who were executed in 1953 after being convicted of passing US atomic bomb secrets to Soviet agents. Both were known as competent, but not particularly outstanding, electrical engineers. They arrived in the Soviet Union from Czechoslovakia

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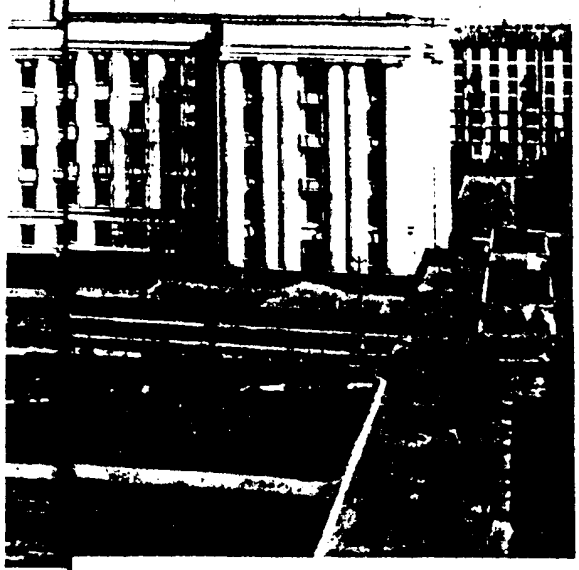


Sovetov. The bureau housed the center for microelectronics and minicomputers in the Soviet Union during the 1960s. Filipp Staros ran the bureau from Room 1900-S, the corner office, with balcony, on the third floor.

at the end of 1955 or the start of 1956.

Here I will discuss in greater detail the career of Staros, who achieved a remarkable degree of celebrity in the USSR for an American.

According to his Soviet colleagues now residing in the West, Staros deserves considerable credit for developing a form of minicomputer used in automating steel mills, power stations and other industrial operations. Some even call Staros the father of microelectronics in the Soviet Union. His parenthood is said to have begun with a seminal paper delivered at a conference of scientists and engineers in November 1958, forcefully suggesting that microelectronics could lead the way toward advancing Soviet weaponry. It is widely accepted that it was Staros who first introduced the term *microelectronica* into Russian—though it wasn't legitimized until Volume 16 of the third edition of the *Great Soviet Encyclopedia* appeared in 1974. In the encyclopedia the word is defined as the field of computer technology dealing with integrated electronic assemblies, including semiconductors.

Staros's former coworkers agree that his ideas gained acceptance for the following reasons: The Soviet Union had encountered great difficulties in developing microelectronics and computers on its own and in introducing such technologies into production processes and weapons systems—though political and military leaders soon grasped the implications of these technologies for defense. So, whether Staros knew it at the time or not, his appearance in the USSR was auspicious. For the men in the Kremlin he apparently embodied the "right stuff"—a combination of characteristics that the Soviets were convinced had led to scientific and technical advances in the US. He was both a well-trained researcher and a hard-driving manager.

Plugged into the Kremlin

Consider, then, these excerpts from three of my interviews with Soviet émigrés:

> Our director was outstanding. On top of being a good scientist and a strong personality, he emanated the aura of an American. In addition, he had high-level connections. He knew Dmitri Ustinov [the late Minister of Defense] and individuals from the Central Committee of the Communist Party and, I think, people from the KGB.

> Staros was invited several times to discuss his projects at meetings of the Military-Industrial Commission [the influential Voenno-Promyshlennaya Kommissiya or VPK].

> Everyone recognized him as not only a thorough professional but also a talented organizer.

There is no doubt that Staros's military connection was important. It provided him with access to the Soviet hierarchy, enabling him to obtain funds and facilities to carry out his research programs. Those dealing with the Military-Industrial Commission, described rather loosely by Henry Kissinger[1] as "a party-state organization in charge of all the defense industries," often come face-to-face with the Soviet political establishment—members of the Central Committee of the Communist Party, deputy prime ministers, senior military officers and top scientists and bureaucrats in the State Committee on Science and Technology.

There also is no doubt that Staros's participation in the construction of the cyclotron at Cornell University in the late 1940s earned him a repute of sorts among Soviet scientists and bureaucrats. Observers of Soviet society such as Hans Rogger[2] and Kendall Bailes[3] claim that US technology and culture superseded those of Western Europe in the 1920s. But Soviet disillusionment with American society set in during the 1930s, due mainly to the Wall Street debacle in 1929 and the Great Depression, which Communists argued was dramatic proof that the predictions by Marx and Lenin of the West's economic collapse were indeed true. Ideology notwithstanding, Soviet enthusiasm for US technology was restored by the end of World War II. Following the death of Stalin in 1953 and especially during the period of détente, US science, technology and culture were held in high esteem.

Still, Soviet leaders were certain they could not depend upon the US or its allies for technological advances. Any sense of scientific and technical inferiority could be dispelled at home and abroad, it turned out, by such

spectacular events as nuclear bombs and space flights. Despite these achievements, though, difficulties persisted in organizing research and in manufacturing products.

After the devastation and debilitation caused by World War II, here came Staros, well-trained and self-confident, apparently heralding a new era of automation and modernization for Soviet factories and industries, as well as for military systems and, possibly, office procedures. He attracted admirers in droves. He held out the possibility of making the right decisions about research programs. He also might show how to manage large research groups, consisting at times of unruly scientists. Such attributes coincided exactly with the Soviet ideal of an R&D operation, in which such outstanding scientists as Abram Ioffe, Mstislav Keldysh, Sergey Korolev and Igor Kurchatov had shown themselves to be successful project managers.

Staros's Soviet colleagues knew little of his past before he arrived from Prague, accompanied by his American wife, four children and another American engineer who called himself Iozef Berg. Some insisted that Khrushchev himself had brought Staros to the USSR. Eric Firdman, an émigré physicist, claims it was Pyotr Vasilievich Dementiev, then the Minister of the Aviation Industry. Others think Staros was recruited by Ustinov, who was Minister of Defense Industries at the time. No matter who was responsible for him coming to the USSR, Staros was treated well from the start. For one thing, his salary was 700 rubles per month—significantly greater than the 550 rubles a deputy minister of the USSR would have been paid each month. For another, within months of his arrival, he was appointed director of a newly established laboratory at a military research institute in Leningrad.

The choice of Leningrad by Soviet authorities appears to have been natural. Leningrad became the center for research on semiconductors after the Soviet Academy of Sciences set up its Physical-Technical Institute and its Institute of Semiconductors, both founded by Ioffe, then considered the country's most influential physicist.

A great transformation

The choice of Staros to head the institute came as a surprise. The somewhat mysterious origin of Staros is characterized in his official Soviet biography in a single sentence: "In 1941, graduated from a university in Toronto and started work as a researcher." Even so simple a statement turns out to be misleading—perhaps intentionally. No university in Toronto had any record of graduating a student named Staros—or of anyone with that name ever attending.

Assessing certain technological advances in the Soviet Union is difficult at best, but even harder when it involves military systems. Secrecy is paramount in such matters. The creators of such technologies are not usually identified, and then only when they have died. Thus, making known the identity of the designer of a Soviet computer would be a curious anomaly—and even moreso when he happened to be an American who worked as an electrical engineer on Cornell's cyclotron in the 1940s and emigrated secretly through Mexico and Czechoslovakia to the Soviet Union in the midst of the US's most controversial spy case. But under the name of Filipp Staros, he attained great importance, though little prominence, as director of a renowned microelectronics institute in Leningrad during the 1960s. Moreover, in 1969 he was awarded a coveted State Prize.

After failing to trace Filipp Staros back to the US or Canada over nearly 18 months, I almost abandoned all hope of solving the riddle. In the summer of 1983, while in Europe on academic matters, I interviewed several émigrés from Czechoslovakia to seek more information about Staros. None of my contacts knew anything about him. The night of my return home to Cambridge, I relaxed with a copy of *The New York Review of Books*. Suddenly, there it was: a review of a book[4] about the Rosenbergs that mentioned their friends who had probably disappeared behind the Iron Curtain. I ran to Harvard Square, bought a copy of the book and found the name Sarant. All the pieces of the puzzle soon fell into place.

Alfred Sarant had received his BS in electrical engineering from The Cooper Union in New York City in 1941. During the war, he worked on communications systems at Fort Monmouth and Bell Laboratories. After the war he took part in constructing the cyclotron at Cornell's nuclear physics laboratory. I showed a snapshot of Sarant, obtained from his sister, to Philip Morrison, who had been at Cornell then. Morrison immediately identified Sarant as his next-door neighbor from 1947 to 1950 in Ithaca, New York. When Eric Firdman, who had worked under Staros in Leningrad, was shown the photograph, he hesitated; then, after a small mustache was drawn on the face, he insisted excitedly that it was Staros.

Of course, a snapshot is not convincing proof. Nor is the name Sarant took in the Soviet Union. Staros's Russian patronymic of Georgievich means son of George, and, indeed, the name of Sarant's father was George. The name Staros sounds Greek in origin. According to his sister, Electra Jayson, their father's full name was Epamenonda George Sarantopoulos, which was later changed to Nonda George Sarant. The family on both sides was Greek Orthodox. His former Soviet colleagues recalled that Staros claimed Greek ancestry and enjoyed Greek movies. Emigrés said Staros had told them he had four brothers. So did Sarant. Firdman and Sarant's sister independently gave identical, detailed descriptions of Sarant/Staros. Firdman recalled that Sarant boasted to his Soviet coworkers that he had once participated in building a cyclotron in the US, though he did not say where or when.

There are also several discrepancies in the known facts about Sarant/Staros. Sarant was born on 26 September 1918. Staros was born in 1917, according to the *Soviet Encyclopedia*, and, according to Firdman, his birth-

snapshot, has been identified by Soviet émigrés as the American electrical engineer who attained fame and fortune of sorts in the USSR under his adopted name of Filipp Staros.

day was observed on 24 February. When Sarant abandoned his wife and children in Ithaca, he left for Mexico on 9 August 1950 with Carol Dayton, the wife of a neighbor. In the USSR, Staros's American wife was called Anna. Staros's close friend was Joel Barr, who also disappeared in 1950. In the USSR, Staros's deputy was named Iozef Berg.

Why did Sarant leave the US and adopt a new identity? It is known that FBI agents interviewed Sarant in Ithaca on 18 July 1950 (a day after Julius Rosenberg was arrested), and accused him of keeping an apartment for espionage purposes at 65 Morton Street in Manhattan. FBI records indicate Sarant was an American Communist Party member until 1944 and that he and Julius Rosenberg belonged to the same cell. After his interrogation, Sarant was told he could visit relatives in New York City and, thereafter, he seems to have dropped from FBI files. In 1951, when asked about Sarant by Rosenberg's lawyers, US District Attorney Irving Saypol issued a statement: "There is insufficient evidence at the present time to warrant filing a complaint against Sarant . . . on any possible Federal charge."

Perhaps Sarant left the US in panic after being questioned by the FBI. The convictions of physicists Klaus Fuchs and Alan Nunn May, the arrest of the Rosenbergs, the escalation of the cold war, the opposition to Communism implicit in the McCarran–Walter immigration act and the imminent rise of McCarthyism all may have had something to do with Sarant's decision to defect. Possibly his decision was strengthened by his marital troubles and his love affair with Carol Dayton. Beyond this, however, there is only speculation.

The Importance of Ideology

What is apparent from my interviews with émigrés and, more recently, with Americans who observed the careers of Sarant/Staros and Barr/Berg in Czechoslovakia and the Soviet Union is that both men were Communist ideologues. Both lived in Czechoslovakia between 1950 and 1956, working in electronics R&D for the military. One informant, Morton Nadler, who lived in Prague from 1948 to 1959 and worked for Antonin Svoboda, a member of the Czechoslovak Academy of Sciences and the country's leading computer scientist, met Staros and Barr just before they moved to the Soviet Union. They attempted to persuade Nadler to come with them and take part in the design and production of minicomputers used to control military and industrial systems. By that time Nadler was disenchanted with Communist socialism and refused to move further East. For a while he exchanged letters with Staros, who bragged that he had first pick of the best and brightest graduate students in the USSR for a new laboratory and was inventing what he called "an eye in the sky," which Nadler interpreted as meaning an electronic spy satellite, though the first sputniks had not yet been launched into space. Nadler concluded from the lifestyles of Staros and Barr that they had "very good connections" and, because they did not socialize with other American expatriates in Czechoslovakia, that they probably had been spies in the US.

Later, in 1976, a US computer expert on a scientific exchange program with the USSR bumped into Berg at a conference on electron microscopy in Tashkent, the capital of Soviet Central Asia. Berg claimed to have been born in South Africa and said he acquired his obviously New York accent from American friends in Johannesburg. During his stay in Leningrad, the American computer expert spent an evening with Berg and his family. Berg called for the scientist in his black Volga, a car generally reserved for important Soviet officials. He brought his guests to his cluttered six-room apartment, an unusually spacious housing arrangement anywhere in the Soviet Union. The guests were greeted by Berg's Czech-born wife, his daughter Vivian and a middle-aged woman by the name of Anna Staros, who had come to Leningrad from Vladivostok to visit her children. Judging by her command of the English language, the computer expert figured she was, like Iozef Berg, a native American. It was obvious from the conversation that she was the wife of Filipp Staros, then working for the Soviet Academy of Science in Vladivostok.

Berg appeared well informed about advanced computer technology in the US. The American scientist considered Berg's information to be possibly no more than two months behind the latest work. Berg asked questions about restricted information and classified technology, but when the American evaded the questions, Berg turned to other topics without showing any irritation or displeasure, though, the American recalled, the sidetrack had not passed unnoticed by Berg.

Once Barr and Berg became one person, it was easy to find out his American background. Barr had been born in New York City in 1916. He received a BS in engineering from City College of New York in 1938 and worked at Fort Monmouth at the same period as Sarant. He also worked at Western Electric and Sperry Gyroscope.

Some assume that the successful careers and special favors for Staros and Berg imply that they were Soviet spies when they lived in the US.

Joel Barr, like Sarant, disappeared soon after the Rosenbergs were arrested on charges of passing atomic secrets to the Soviet Union and turned up as a microelectronics expert, according to former colleagues, at the Leningrad Design Bureau during the 1950s and 1960s.

Considering the suspicious and conspiratorial nature of Soviet leaders, it is difficult to comprehend how else Staros and Barr could attain such positions of importance in the USSR. The most plausible explanation is that they provided knowledge and skills the Soviet Union then lacked. They excelled in microelectronics technology, and Sarant/Staros especially, by dint of his experience at Bell Labs, knew how to manage a research organization. Whatever the reasons, Staros became a respected member of the Soviet military R&D community, a rare privilege for a Russian scientist or engineer, let alone an expatriate American. To achieve this status, a Soviet scientist or engineer needs a second-class clearance from the KGB. Presumably, Staros and Berg had such security clearances.

When he left the US in 1950, Sarant had limited knowledge of US computer technology and microelectronics. Computers still used vacuum tubes. Perhaps the single development with the most far-reaching consequences for computers was the transistor, invented by William Shockley, John Bardeen and Walter Brattain at Bell Labs in 1947. Staros may have gained better understanding of computer design while working in Czechoslovakia, where he was in touch with Svoboda. Even so, his former Soviet colleagues say, Staros's opinion of Czech computer science was quite low.

Lab with a box number

Staros kept informed about developments in electronics mainly by reading US journals. By way of this form of technology transfer he was able to manage a series of spectacular successes in his early years in the Soviet Union. Firdman asserts that Staros "sped up work on airborne computers"—one of the major gaps in Soviet military technology in the 1960s. This helps explain why Staros may have been a favorite of Dementiev and Ustinov. With each achievement he was able to expand his lab, first into a design bureau and then into a combination design bureau and production plant. At the start, recalls Firdman, Staros had about a dozen people. When Firdman arrived in 1964, Staros's bureau was so secret it was known as *pochtovyi yashchik*—that is, a postal box number. It was called Post Office Box 155, Leningrad. But, says Firdman, it was known for its military research. The lab had more than 800 employees and some pilot production lines for semiconductors.

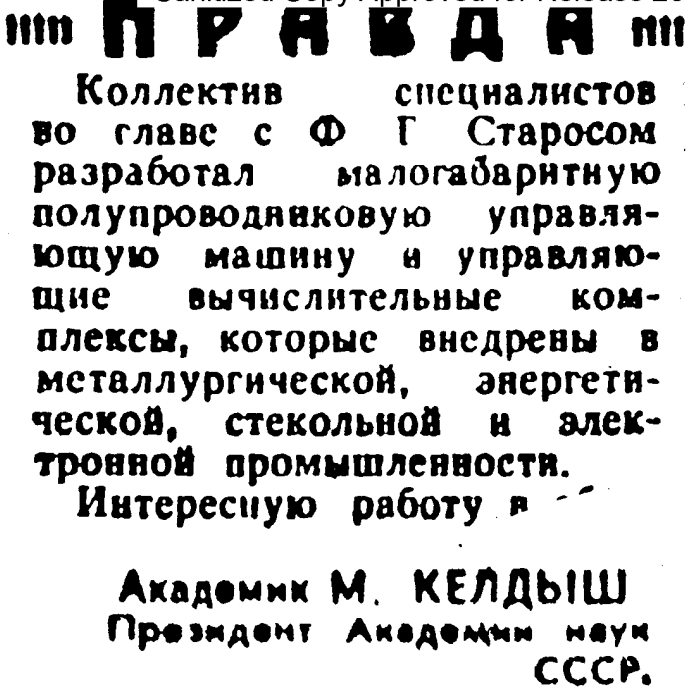
It was unquestioned that Staros had the support and confidence of the Soviet military and political oligarchy. One of the earliest signs came in 1958, when Staros presented a report to a conference of scientists and managers in the electronics industry. It advocated a major commitment to accelerate R&D in microelectronics. The military and political decision was to accept Staros's report. After 1960, Staros was accorded the title of chief designer. In 1967 he was awarded the additional title of Doctor of Technical Sciences, and in 1969 he received the State Prize. The citation, signed by Keldysh, the president of the Soviet Academy of Science, credited Staros with heading a "collective of specialists" who developed a small computer used to control production processes in the energy, metals, electronics and glass industries.

The computer was produced at Staros's Leningrad Design Bureau, located in a wing of the rococo Dom Sovetov, built in the style known derisively in the Soviet Union as Stalin Gothic. The machine was identified only as UM-1-NKh. Weighing 150 pounds, the 100-watt UM-1 contained 8000 transistors and more than 10 000 resistors and capacitors. At the time, its designer was said to be a certain Comrade Filippov. Not until Staros got the State Prize was the identity of Filippov publicly made known as Filipp Georgievich Staros.

The NKh in the computer's name formally stood for *Narodnoe Khozyaistvo* (State Economy), says Firdman, but the behind-the-bench joke was that it also stood for Nikita Khrushchev, considered the godfather of Staros's design bureau. Khrushchev visited the lab in 1962 to see UM-1 and its 264-pound successor, named Electronica K-200.

The Leningrad Design Bureau's K-200 attracted attention in the West. A process-control computer, using the first Soviet-made integrated circuits and capable of performing 40 000 operations per second, it was not considered an innovative departure by American and British reviewers, but its appearance was hailed as a well-engineered

researchers was announced in *Pravda* on 9 November 1969 under the headline "New Squadron of Laureates." The citation was signed by Mstislav Keldysh, president of the Soviet Academy of Science.



machine, "surprisingly up to date."

Staros's influence had increased enormously in 1961 with the creation of a powerful bureaucracy, the State Committee of the Electronics Industry, which rose to the status of a ministry in 1965. The minister, Alexander Shokin, received his engineering degree in 1934 from Bauman Advanced Technical College in Moscow, one of the most prestigious engineering schools in the USSR. He worked for many years in the defense industry and, after World War II, became Deputy Minister of Radio Technology, which was responsible for producing electronic components for radar, communications equipment and computers. The components included various types of vacuum tubes, magnetrons, klystrons, transistors, semiconductors and integrated circuits. From its outset the State Committee of Electronics Industry was hailed as perhaps the haughtiest of the so-called "Eight Sisters"—the eight industrial ministries most important in military production. Obviously, as the head of the ministry, Shokin wielded great power. He also was under great pressure to come up with rapid developments equal in quality to those in the West. To do this, Shokin gave Staros the task of planning a semiconductor R&D facility just outside of Moscow.

With the full support of the Central Committee and the Council of Ministers, Staros created the Center for Microelectronics at Zelenograd, which has since become the Soviet Union's high-tech capital, a sort of state-run Silicon Valley.[5] The center was organized according to Staros's grand design. Firdman, now a computer specialist in the US, describes it:

> All development of the center was undertaken by a group of five to ten people under the direction of Staros. Our project was not the result of wishful thinking. It was meticulously thought out. We were young and enthusiastic. Staros knew all the relevant people, enjoyed high authority and had carte blanche from Khrushchev....

The decisions to establish the Zelenograd center were all classified. It was the first of several more microelectronics laboratories that were soon set up in Riga, Minsk, Tallin, Erevan and Tbilisi. Firdman says the model for these centers were R&D labs at such US companies as IBM, Texas Instruments and Raytheon. The operation at the Zelenograd center had additional American idioms. As Firdman recalls it, Staros consumed dozens of US scientific journals every day. "Nobody could make an appointment with the boss without preparing himself by reading American scientific literature that dealt with the topic of discussion," says Firdman.

The Zelenograd center included several research institutes and design bureaus, a technical college (now the Institut Electronnoi Tekhniki) and a production plant. Staros was appointed Associate Director General of Research, a post he held concurrently with his job as chief of the Leningrad Design Bureau. The dual appointment caused trouble for Staros. He was forced to stay in Leningrad to counter attacks by the local party authorities against his recruitment and research practices. The Leningrad bureaucrats objected to a foreigner, particularly an American, running a prestigious, top-secret lab. Moreover, they raged against Staros's habit of hiring on the basis of merit, often taking on Jews and nonparty members. To make matters worse, Staros resisted party attempts to force him to hire favored people. Under constant criticism particularly from Grigori Romanov, the second secretary of the Leningrad regional party, Staros spent less and less time at Zelenograd, which developed so successfully that his Soviet colleagues soon realized they had a ripe plum in their hands.

In desperation, Staros wrote to Khrushchev, detailing his grievances against the powerful Leningrad party and complaining about the lack of support from the Minister of the Electronics Industry, Shokin. Unfortunately, Staros's timing could not have been worse. He sent his letter in early October 1964. Khrushchev was overthrown a few days later, on 14 October.

In the aftermath, Staros's letter, dealing with electronics, was dutifully forwarded to none other but the minister involved, Shokin. The minister's action was predictable. Staros was summoned from Leningrad to Shokin's office. An émigré source gave an account of Shokin's words to Staros: "Filipp Georgievich, it seems to me you have the strange fantasy that you are

ИЗВЕСТИЯ СОВЕТОВ Н.

Ф. Г. СТАРОС

Советская наука понесла тяжелую утрату. На 63 м году жизни скоропостижно скончался член президиума Дальневосточного отделения АН СССР, лауреат Государственной премии, доктор технических наук, профессор Филипп Георгиевич Старос.

Смерть вырвала из наших рядов неутомимого ученого, талантливого организатора, многие годы отдававшего все свои силы и яркий талант исследователя развитию советской науки и техники.

Возглавляя в течение 20 лет конструкторское бюро электронной промышленности, главный конструктор Филипп Георгиевич Старос внес большой вклад в становление и развитие отечественной микроэлектроники. Ему принадлежит ряд основополагающих идей, получивших признание и дальнейшее осуществление в работах ряда предприятий и организаций страны.

Последние годы Филипп Георгиевич Старос руководил коллективом ученых Дальневосточного отделения АН СССР, до конца оставаясь на переднем крае отечественной науки.

Светлая память о Филиппе Георгиевиче Старосе навсегда останется в наших сердцах.

Президиум АН СССР. Коллегия Министерства электронной промышленности СССР. Государственный комитет СССР по науке и технике. Дальневосточное отделение АН СССР.

Staros's obituary, lauding him as an "indefatigable scientist and talented organizer" at the Leningrad Design Bureau, appeared in *Izvestia* on 17 March 1979. Signed by a panoply of scientific and political organizations, the death notice said the memory of Staros "will remain in our hearts forever."

the founder of Soviet microelectronics. That is all wrong. The Communist Party created Soviet microelectronics, and the sooner you realize that fact the better it will be for you."

Staros's position at both Leningrad and Zelenograd clearly were in jeopardy. Early in 1965, he was removed from the Zelenograd associate directorship, but Shokin himself intervened to keep Staros at the top at the Leningrad Design Bureau. Then, in 1970, the Leningrad Party boss, Vasilyi Sergievich Tolstikov, was appointed ambassador to the People's Republic of China, and Romanov was elevated to the top of the regional party. "Romanov tried to push our design bureau to merge with a big research and manufacturing organization named Positron, and Shokin was able to extricate Staros," recalls a former coworker at the Leningrad Design Bureau.

The Kremlin strikes back

Still, Staros undoubtedly realized that new masters were manipulating events he had no power to influence. In 1973, Romanov became an alternate member of the Politburo, which gave him absolute control of the Leningrad region. One of his first actions was to initiate a merger of Staros's design bureau with the larger research laboratory of the Svetlana radio manufacturing company. Staros faced another turning point, as he had at Cornell in 1950: He could stay on and endure the consequences or he could start life anew somewhere else. Thus, at the age of 60, Staros decided to accept the offer of running an electronics lab in the newly created Far East branch of the Soviet Academy in Vladivostok. To lure him to Vladivostok, 11 time zones from Leningrad, the prospect of Academy membership was dangled before him.

The move brought him neither any new possibilities for advanced research nor membership in the Academy. His name appeared on the list of prospective academicians several times, the last in 1979. It was bruited in Academy circles that he was supported by Keldysh and Defense Minister Ustinov, but the old boy network opposed him. He was admired by his workers but resented by his peers. Staros did not practice the research style so often favored by Soviet academicians: a systematic approach that requires patience and relative anonymity. Staros, by contrast, was impatient and egoistic.

At his death in March 1979, supposedly from a heart attack while riding in a taxi in Moscow, none of his computers was in mass production. His obituary appeared in *Izvestia* on 17 March, saying:

> Soviet science has suffered a heavy loss. In the 63rd year of his life, Professor Filipp Georgievich Staros, a member of the Presidium of the Far East Division of the Academy of Sciences of the USSR, a recipient of the State Prize and Doctor of Engineering, passed away suddenly. Death has torn from our ranks an indefatigable scientist and talented organizer, who for many years devoted all his efforts and brilliant talents to the development of Soviet scientific and technological research. As head of a design bureau in the electronics industry for 20 years, Chief Design Engineer Filipp Georgievich Staros made a great contribution to the formation and development of microelectronics for the fatherland. The memory of Filipp Georgievich will remain in our hearts forever.

The obituary was not signed by Staros's family, friends or colleagues, in keeping with Russian custom, but by the Soviet bureaucracy—the Academy of Science, the Ministry of the Electronics Industry and the State Committee on Science and Technology. This was an official expression of appreciation for an American expatriate who pioneered Soviet microelectronics in a national hour of need.

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Marching orders: The military imperative

The Soviet military has an awesome hunger for electronics. But feeding the martial bear leaves other sectors hungry

Mark Kuchment, a Russian emigre, science historian and fellow at Harvard University's Russian Research Center, has noticed that many Americans visiting the Soviet Union experience a similar puzzled reaction. "How can this backward country be any threat to the United States?" they find themselves wondering.

What such visitors often fail to realize, Kuchment explains, is that in the Soviet Union, science most often is targeted toward the well-fed and pampered Soviet military machine. The military, as a result, has been far more successful in absorbing modern technology than have the relatively backward industrial and consumer sectors.

"The military and civilian worlds are completely different," agrees Thane Gustafson, director of Soviet Studies at the Center for Strategic and International Studies at Georgetown University. "Has the military developed magic solutions to get things done?" he asks. "To some extent, yes."

Kuchment elaborates, outlining the factors that have contributed to the Soviet Union's effective program in military research and development. "First and foremost, military research has high priority," he explains. If, for instance, there are enormous cost overruns, "no one cares." Military researchers enjoy salaries 30% to 60% higher than those in civilian industries. And bonuses are lavish. Completion of a high-priority military project could mean a full year's salary in bonuses for 10 to 15 leading participants. Everyone else on the project would receive a bonus equivalent to one or two months' salary.

Military work in the Soviet Union is "considered a prestigious thing. Civilians are friendly to the military. Civilian scientists, if asked, might consult for free with the military." And the military attracts many talented youths, particularly from provincial areas, because it is a proven route to social eminence and authority. Military researchers typically have "better access to other higher levels of Soviet bu-

KUCHMENT: 'If the Soviet military has enormous cost overruns, no one cares. Military researchers enjoy salaries 30% to 60% higher than those in civilian industries. And bonuses are lavish'

reaucracy," a significant consideration in a society in which power is concentrated and many favors are bestowed from above.

Military projects have first priority in getting equipment that is in short supply. Advanced computers that have three-year waiting lists may be procured within months by favored military projects.

Anatol Fedoseyev, a pioneering Soviet designer of the powerful magnetrons used in radar transmitters, submits that Russian researchers are uniquely well informed on international technology developments. Periodicals and samples of foreign equipment are supplied plentifully and are "supplemented by classified materials that are fed into the first departments [KGB offices] of enterprises working for the military. The classified material consists of blueprints, reports and other types of information obtained from the West in an 'informal manner,'" Fedoseyev reported to the seminar series on Soviet Science and Technology, jointly sponsored by Harvard University, the Massachusetts Institute of Technology and the Ford Foundation.

"Researchers in the West have very limited access to information about companies with which they are in competition, whereas their Soviet counterparts have access to internal information from competing major corporations around the world," Fedoseyev adds. This contention is supported by the testimony of Eric Firdman who, working in Leningrad in 1963, saw blueprints for International Business Machines Corp.'s 360 model, which was not announced until the following year.

Though the Russians keep up with foreign technology and have shown no reluctance to copy or steal what they want, they have been shrewd enough to recognize the importance of domestic production capability for all components. 'The foreign parts would have to be duplicated," Firdman says, explaining that the military "never would allow a piece of foreign hardware to be installed in a military design." The Russians deftly have walked the line between imitation and dependence.

Gustafson suggests one final factor that has allowed the Russian military to outperform the civilian sector: Alone among Russian industries, the military "works under direct competitive pressure: the U.S. military."

Still, there are some inherent weaknesses to Soviet military research and development, according to Kuchment. Secrecy can be used to cover poor performance. Excessive political control often leads to employment and advancement of the "politically reliable," and not necessarily the technically proficient. And, astoundingly, seemingly senseless work disruptions are common. It is not unusual for top military researchers to be called in suddenly to help with the local harvest or to line the streets and wave flags for some orchestrated political welcome or demonstration.

Perhaps more significant is the fact that the Russian military cannot draw on sophisticated civilian technology, equipment and instrumentation bases. According to Gustafson, the Russians are aware that weakness in the civilian technology sector can hold back the

military.

"The Soviet military has learned that it has to be concerned about the computer-science industry," Gustafson says. "They are obsessed with trying to reform their system to improve their innovative ability. The military is aware that they cannot build a first-class military machine on the basis of 19th-century smokestack industry." So, he says, the Russians have made development of a computer industry "a high priority. They're throwing money at the whole area, setting up institutes, training people, and copying like crazy."

But in relying on this sort of dictated solution, the Russians appear to be repeating the very mistake that, time and again, has impeded their development of a modern industrial base. Though centralized planning focused on specific objectives has worked well for the military, rigid personal and economic controls have left industry in a technological backwater.

A Russian researcher, for instance, works under numerous constraints. Supervised by the KGB, his mail and phone calls are monitored routinely. He is expected to engage in politically sanctioned activities. He labors to the accompaniment of patriotic music, regularly piped into many research facilities.

And, of course, the flow of capital is controlled. Instead of efficiently chasing opportunity, capital is applied by committee through layers of bureaucracy. Whereas in free-market economies new ideas and technologies constantly are bubbling to the surface, Russia attempts to impose innovation from above.

"There's not enough incentive. The system does not encourage innovation," Kuchment argues. A plant manager concerned about meeting quotas knows that installation of new equipment will slow him down for the next year. And the cumbersome bureaucracy complicates and slows decision-making. The result, experts agree, is an economy weak in the origination of new technology and clumsy in its implementation.

NORM ALSTER

Selected Soviet and East European legal and illegal acquisitions

Key technology area	Notable success
Computers	Complete systems designs, concepts, hardware and software, including a wide variety of Western general purpose computers and minicomputers, for military applications
Microelectronics	Complete industrial processes and semiconductor manufacturing equipment capable of meeting all Soviet military requirements, if acquisitions were combined
Signal processing	Processing equipment and know-how
Manufacturing	Automated and precision manufacturing equipment for electronics, materials, and optical and future laser weapons technology; information on manufacturing technology related to weapons, ammunication and aircraft parts including turbine blades, computers, and electronic components; machine tools for cutting large gears for ship propulsion systems
Communications	Low-power, low-noise, high-sensitivity receivers
Lasers	Optical, pulsed power source, and other laser-related components, including special optical mirrors and mirror technology suitable for future laser weapons
Guidance and Navigation	Marine and other navigation receivers, advanced inertial-guidance components, including miniature and laser gyros; missile guidance subsystems; precision machinery for ball bearing production for missile and other applications; missile test range instrumentation systems and documentation and precision cinetheodolites for collecting data critical to postflight ballistic missile analysis
Structural Materials	Titanium alloys, welding equipment, and furnaces for producing titanium plate of large size applicable to submarine construction
Propulsion	Missile technology; some ground propulsion technology (diesels, turbines and rotaries); advanced jet engine fabrication technology and jet engine design information
Acoustical Sensors	Underwater navigation and direction-finding equipment
Electro-optical Sensors	Information on satellite technology, laser rangefinders, and underwater low-light-level television cameras and systems for remote operation
Radars	Air defence radars and antenna designs for missile systems

Source: U.S. intelligence agencies

Ted Fitzgerald

Vaccine Liability Threatens Supplies

By PHILIP M. BOFFEY

WASHINGTON

THE nation's major drug companies, some stung by large liability costs, have been dropping out of vaccine production for years and the trend is continuing, raising fears that future supplies may be jeopardized, important research will be neglected and the costs of vaccines may skyrocket.

The latest dropout was Wyeth Laboratories, which announced June 13 that it had ceased production of a vaccine used to immunize children against whooping cough after more than 30 years of producing it. The company cited "dramatic increases in the cost of participating in this market," chiefly due to liability insurance and the costs of litigation. The whooping cough vaccine has the most serious side effects of any of the vaccines now administered to virtually all children in the country under state or Federal laws.

The Wyeth defection continued a trend that has been under way for the past decade or two, according to Paul D. Parkman, deputy director of the center for drugs and biologics at the Food and Drug Administration. During the 1960's, Dr. Parkman said, there were eight manufacturers of the combined vaccine that is used to immunize children against diphtheria, whooping cough, and tetanus; now, after Wyeth's withdrawal,

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The New York Times / Rick Friedman

Dr. Mark M. Kuchment, above, found that top Soviet researcher was Alfred Sarant, right.

How a Soviet Secret Was Finally Pierced

By WILLIAM J. BROAD

Sleuth learned Russian scientist and missing American were same.

ABOUT three years ago a kind of obsession began to take hold of Dr. Mark M. Kuchment, a 48-year-old science historian who emigrated to this country in 1975 from the Soviet Union.

While interviewing Soviet émigrés for a Harvard University research project, Dr. Kuchment kept hearing stories of an American engineer who had achieved dazzling success in the secret world of Soviet military research. An American? How could that be?

Dr. Kuchment, who was born in the Ukrainian port city of Odessa and educated in Russia, set out to find the answers. In doing so he would ultimately solve a mystery of science and international intrigue that had baffled scholars and Federal agents for a third of a century.

The tale pieced together by Dr. Kuchment finally revealed that Filipp Georgievich Staros, a high official in the secretive world of Soviet military research, and Alfred Sarant, an American engineer who fled the United States after the arrest of his close friend Julius Rosenberg in 1950, were one and the same.

Dr. Kuchment, who teaches at Boston University and is a fellow at the Russian Research Center at Harvard, described his detective work in a recent interview. He said his inquiry shed little light on the debate over the guilt or innocence of Julius and Ethel Rosenberg, who were executed in 1953 after being convicted of passing atomic bomb secrets to the Soviet Union.

But he believes that it does reveal much about Soviet technology, about the flexibility of Soviet officials in exploiting the skills of a foreigner and about the mentality and motives of a defector who took up life in the Soviet Union.

"It's a strange and interesting story," said Dr. David Holloway, an expert at Stanford University on the Soviet military, as he re-

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EDUCATION

Plan Urges Broader Scope In Journalism

By JONATHAN FRIENDLY

STUDENTS of journalism and mass communications should get more and better undergraduate training in the liberal arts and less work in vocational skills, according to a model curriculum being proposed after a two-year survey.

The proposed curriculum, described in a report last month from a study group of the Association for Education in Journalism and Mass Communication, parallels ideas advanced in other disciplines, particularly teacher education, to marry improved liberal arts training to a core of instruction in the history and theory of the craft, rather than in its technologies and methods.

"The end goal of our programs should be to make our students more curious about the world rather than self-satisfied that a few writing techniques are all one needs to cope with the complexities of contemporary society," said David Eason of the University of Wisconsin at Milwaukee, a participant in the survey.

The model curriculum has been proposed amid a multisided debate about the scope and quality of 300 programs enrolling more than 80,000 undergraduates seeking careers in journalism, advertising and public relations.

Ever since Joseph Pulitzer founded the country's first graduate school of journalism at Columbia University in

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How a Sleuth Finally Pierced a Russian Secret

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flected on how an American could become so well entrenched in the Soviet military. "As far as I know the case is unique — somebody coming from abroad and not only getting an important research post in the Soviet Union but a military one as well."

Dr. Kuchment says he was intrigued by the idea of an American scientist seeking out a country that he, a science historian, had so gladly left behind.

The man described to Dr. Kuchment by émigrés as an American was the chief designer at a military research laboratory in Leningrad and was the driving force behind the establishment in the Soviet Union of the field known there as "microelectronics," computers that use transistors and silicon chips instead of bulky tubes.

The name of the mysterious innovator was said to be Filipp Georgievich Staros.

"I was amazed that an American had made it in the military, and I thought it would be a difficult story to confirm," Dr. Kuchment recalled the other day at his apartment in Cambridge, Mass. But the science historian soon came across a very significant fact. "Staros had won the Soviet State Prize," he said. "So there was a public record on the guy."

'Brilliant' Researcher Died in 1979

In a Soviet yearbook Dr. Kuchment found a biographical sketch. He also learned that Mr. Staros had died in 1979 and found an an obituary in the Government newspaper Izvestia that hailed his research as "brilliant."

But some of the new information was impossible to confirm. It was said, for instance, that Mr. Staros had graduated from the University of Toronto, but the registrar's office there had no record of such a person.

Who was the person behind the false identity? "He was probably a foreigner because they put him at Toronto," Dr. Kuchment recalled. "And there were other clues. The name Staros sounds Greek, so I assumed he was a Greek American."

The breakthrough came after nearly two years of interviewing and research, and after Dr. Kuchment had almost given up hope of solving the riddle.

"I had gathered many little facts on his life in the Soviet Union — that Staros was married to an American woman, for example, and that they had arrived from Czechoslovakia after spending some years there."

"The insight came in the summer of 1983," he continued. "I had to go to Europe on business and I decided I would try to meet with some emigrants from Czechoslovakia so I would have a better understanding of where the Americans had come from. I made the contacts, but to no avail. They didn't know a thing."

"I came back quite exhausted," Dr. Kuchment said, "and I decided to relax and read the latest issue of The New York Review of Books. And suddenly there it was. I read a review of a book about the Rosenbergs that said it didn't pay much attention to people who were friends of the Rosenbergs who had probably disappeared behind the Iron Curtain."

"It was 9 o'clock in the evening," he recalled, "and I immediately ran off to Harvard Square because our bookstores are open quite late. I realized that even though they didn't mention much in the book it was going to be good enough for me."

"Immediately I found my guy — Alfred Sarant, which sounded like a contraction of a Greek name," he said. "All the pieces started to fall into place."

Electronics Engineer at Cornell

In 1950 Mr. Sarant was a 32-year-old electronics engineer who had worked at Cornell University in Ithaca, N.Y., on the construction of a cyclotron, a form of particle accelerator. In the early 1940's he had been a member of the American Communist Party.

> "I found my guy — Alfred Sarant. All the pieces started to fall into place."

According to the book, "Invitation to an Inquest," Federal Bureau of Investigation agents went to Ithaca to see Mr. Sarant on July 18, 1950, a day after Mr. Rosenberg's arrest, and accused Mr. Sarant of keeping an apartment at 65 Morton Street in New York City for espionage purposes.

Mr. Sarant protested that he was innocent. Not long afterward, using false identification, he and Carol Dayton, the wife of a neighbor in Ithaca, went to Mexico. Relatives and the Federal authorities never heard from the two again.

The problem was proving that Mr. Sarant had taken a new identity. "There is a simple way," Dr. Kuchment said. "You get his photograph and show it to two sets of people."

Dr. Kuchment managed to get a photo of Alfred Sarant from the engineer's sister in the United States, who said the family was indeed of Greek descent. He took the snapshot to Dr. Philip Morrison, who had worked at Cornell and who said it clearly showed his neighbor, Alfred Sarant, in the 1950's.

Next, he took it to one of the Soviet émigrés who had worked for Mr. Staros in the Soviet Union.

"He looked at it for a long time," Dr. Kuchment recalled, "and then he said, 'Oh, Mark, could I draw a slight mustache?' We did and he smiled and said, 'Yes, that's Staros.' "

"Of course, a photograph is not an absolute piece of evidence," Dr. Kuchment added. "You have to have other things. For example, the Russian patronymic of Staros means son of George and indeed the name of Sarant's father was George. And Staros always claimed he had four brothers. And, yes, Sarant had four brothers."

Dr. Kuchment also gathered evidence showing that Mr. Staros's best friend and right-hand man in the Soviet Union had been Joel Barr, another Rosenberg associate who in 1948 had left the United States.

Was Mr. Sarant a Spy?

Dr. Kuchment says he has no doubt whatever about the real identity of the mysterious Soviet researcher. And although he has published his thesis, the Soviet Union has not, to his knowledge, responded.

Was Mr. Sarant a spy? And does the episode cast light on the much-debated case of the Rosenbergs?

To both questions Dr. Kuchment answers a tentative no, although he says new evidence could change his conclusion. The field of computation that Mr. Sarant excelled at in the Soviet Union did not exist at the time he fled the United States. What he brought to the Soviet Union, Mr. Kuchment says, were superior skills, his American background and a knack for teamwork.

Mr. Sarant clearly was quite successful. By 1964 his institute had about 800 employees, according to Dr. Kuchment's sources. Although the military side of Mr. Sarant's career is wrapped in secrecy, he also designed civilian computers that achieved wide Soviet acclaim, such as the UM-1-NKh and the Electronica K-200, according to Dr. Kuchment. Researchers at the Rand Corporation at the time called these Soviet machines "surprisingly up-to-date."

"The cold war was in full swing," notes Dr. Holloway of Stanford. "One guess as to why Sarant and Barr were so valuable was that it was an area in which the Soviets were so backward. As foreigners they probably couldn't have made the same kind of inroads in areas where the Soviets were strong, such as nuclear physics."

According to Dr. Kuchment, the fast rise of Mr. Sarant in a secret area of research also casts light on the Soviet bureaucracy.

"It shows the Soviets can have enormous flexibility when a project is sufficiently high on their list of priorities," he said. "Sarant was clearly a security risk. But ultimately they cared only about his work, not his background. And this decision could be made only by very high officials in the Soviet Union."

Indeed, according to Dr. Kuchment's sources, Mr. Sarant knew Dmitri F. Ustinov, now the Soviet Defense Minister, as well as Nikita S. Khrushchev, who is said to have visited the research institute.

He Ran Afoul of Bureaucracy

The episode is also revealing of the Soviet system, said Dr. Kuchment, because Mr. Sarant, despite his achievements, ultimately ran afoul of the bureaucracy and was demoted to a minor post in Vladivostok on the Sea of Japan in Siberia.

The problem appeared to be that he hired on the basis of merit rather than party loyalty, and his employees included Jews and non-party members. This, Dr. Kuchment said, infuriated party officals.

Another possible factor in his downfall, said Dr. Kuchment, was détente and the sudden availability in the 1970's of computers from the West.

Dr. Kuchment says the saga of Alfred Sarant is far from complete. "Why did he get so disappointed in the American system?" he asked. "Maybe he was just driven out because of unfortunate circumstances. But there also was something else in American life at that time, some kind of ideological vacuum. How could such a bright guy turn to such a primitive theory as Marxism? For me, that's a very substantial question."

Dr. Kuchment says it is especially important given the difficulties that Mr. Sarant experienced late in his Soviet career.

"He was a very cautious and very reserved man," said Dr. Kuchment, who speaks of Mr. Sarant the way he might recall an old friend. "He didn't speak that much on political issues. He was very unhappy, very frustrated, especially in the last period of his life. He was appalled by Soviet anti-Semitism."

"The image I am getting is of an idealistic Communist who was terribly disappointed in the social realities of the Soviet Union," he said. "But it was too late. There was no way to back out. Maybe it was that he had worked for the military and couldn't imagine a set of circumstances in which he could go back to the United States."